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| 09/888,530 | 06/26/2001 | Seiji Umemoto | Q65159 | 9350 |

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| EXAMINER |
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CARIASO, ALAN B

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| ART UNIT | PAPER NUMBER |
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2875

DATE MAILED: 01/16/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/888,530

Applicant(s)

UMEMOTO ET AL.

Examiner

Alan Cariaso

Art Unit

2875

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 September 2002.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) 5 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 6 is/are allowed.
- 6) ☒ Claim(s) 1-4, 7-17 and 19-24 is/are rejected.
- 7) ☒ Claim(s) 18 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other:

DETAILED ACTION

Response to Amendment

Claim Objections

1. Claim 22 is objected to because of the following informalities: Claim 22, recites the subject "the refractive index" of the phrase that ends with "is constituted by a tacky layer". The subject does not appear to correspond to the object of the phrase. It the subject should be "the adhesive layer". Appropriate correction is required.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in-

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

3. Claims 1-4, 7-9, 11 and 12 are rejected under 35 U.S.C. 102(e) as being anticipated by MASUDA et al (US 6,340,999 B1).
4. MASUDA discloses a plate-like member (light guide 3, figs.1,9,10) including light output means (3d,3e,3f;fig.1) formed in an upper surface (3c) of the plate-like member

Art Unit: 2875

(3) so that light incident on an incidence side surface (3a) of the plate member (3) is exited from a lower surface (3b) of the plate-like member (3) through the output means (figs.1,9,10); an adhesive layer (10 or 10a;figs.1,9,10) having a refractive index lower ($n=1.38$; col.15, lines 34-39; col.17, lines 25-29) than that of the plate member ($n=1.49$, col.15, line 39); and an anti-reflection layer (8, fig.9; col.14, lines 34-41) made of a circular polarizer (4, col.11, lines 24-50) and bonded to a lower surface (3b) of the plate member (3) through the adhesive layer (10,10a); wherein the anti-reflection layer (4,8) made of a circular polarizer (4) includes a quarter-wave plate (4c), a half-wave plate (4b), and a linear polarizer (4a, col.11, lines 40-44); wherein a maximum intensity of light exited from the lower surface of the plate member in terms of a plane perpendicular to reference planes of both the lower surface and incidence side surfaces is inclined at an angle of not larger than 30 degrees with respect to a normal to the reference plane of the lower surface (fig.4A); wherein the light output means (3f) formed in the upper surface (3c) of the plate member (3) is formed by a repetitive structure of prismatic structures (3d,3e) each shaped like a triangle in section (fig.1) and each having an optical path changing face (3e) inclined at an inclination angle that includes the range of 35 to 48 degrees (fig.1 shows that inclined surface 3e forms an inclination angle of approximately 40 degrees) with respect to the reference plane of the lower surface (3b); wherein ridgelines (vertex between 3d or 3e in fig.2) of the prismatic structures (3f) are inclined within a range of ± 30 degrees (shown as 23 degrees in fig.2; col.13, lines 48-54; col.14, lines 14-18) with respect to the reference plane of the incidence side surface (3a); wherein the refractive index of the adhesive layer (10,10a)

for bonding the anti-reflection layer (4,8) to the lower surface (3b) of the plate member (3) is lower than the plate member by 0.01 or more (col.16, lines 10-12); wherein the refractive index of the adhesive layer bonding the anti-reflection layer to the lower surface of the plate member is not higher than 1.47 (col.16, lines 23-25, $n=1.38$); wherein a plane light source unit (1,fig.1) comprises a light source (2) being disposed on one side (3a, fig.1) of a light pipe (3) defined in claim 1; wherein a reflection type liquid-crystal display device (5,fig.1) having a cell (5a,6,7,5b,fig.1) including a reflection layer (7) is disposed on a light exit side (3b) of a plane light source (1) unit defined in claim 11.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over MASUDA et al (US 6,340,999 B1).

3. MASUDA discloses applicant's invention except the adhesive layer being constituted by a tacky layer. It would have been obvious to one having ordinary skill in the art at the time of applicant's invention to provide the plane light source unit with the adhesive layer (10,10a) constituting a tacky layer since it was known in the art that a tacky layer or substance is an art-equivalent reference to an adhesive substance.

Art Unit: 2875

4. Claims 13, 14, 16, 17, 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over IWAMOTO et al (US 5,046,826).

5. IWAMOTO discloses a light pipe comprising: a plate-like member (1303-fig.13) including light output means (1305) formed in a lower major surface of the plate-like member (1303) so that light incident on an incidence side surface (side(s) adjacent the light source(s) 1301 or 1302) of the plate-like member (1303) is exited from an opposite upper surface (1304-fig.13) of the plate-like member (1303) through said light output means (1305); a light-diffusing layer or film (1306) bonded to the upper surface of the plate-like member through said adhesive layer; given the structure of plate-like member (1303) and the illustrated light exiting in a substantial direction normal or within an acute angle normal to lower and upper surfaces of the plate-like member, an inherent maximum intensity of light exits in that direction; wherein the light output means (1305) is constituted by a plurality of sectionally triangular prismatic structures (fig.13) having optical path changing faces inclined at an inclination angle, as best illustrated and measured from fig.13, that is just within the range of 35-48 degrees; wherein at least one light source (1301-fig.13) is disposed on one side surface of the light pipe.

6. However, IWAMOTO does not disclose in the embodiment of figure 13: the light output means formed in an upper surface of the plate-like member and light exiting from a lower surface of the plate-like member; an adhesive layer having a refractive index lower than that of the plate-like member bonded to and between the light-diffusing layer and the lower surface of the plate-like member; the light-diffusing layer including fine

prismatic structures formed in a surface thereof; the direction of maximum intensity of exiting light of the plate-like member being within 30 degrees with respect to a normal of the reference plane of the lower surface; and the adhesive layer constituting a tacky layer.

7. In regards to the light output means formed in an upper surface and light exiting from a lower surface of the plate-like member, it would have been obvious to one have ordinary skill in the art at the time the invention was made to rearrange the upper and lower surfaces of the plate-like member, since it has been held (In re Japikse 181 F.2d 1019; In re Kuhle, 526 F.2d 553) that a mere rearrangement of the element without modification of the operation of the device involves only routine skill in the art. One would have been motivated to rearrange the upper and lower surfaces of the plate-like member of IWAMOTO for the purpose of viewing from below an LCD positioned on the lower surface of the plate-like member.

8. In regards to the adhesive layer, IWAMOTO teaches an adhesive layer having a smaller refractive index than the PMMA material of light-transmitting member (1402-1, 1402-2; fig.6) for the purpose of preventing cross-talk (col.2, lines 1-10) between the light-transmitting or light-guiding sheets (1407), and having an adhesive (104) bonding a light scattering or diffusing layer (104-fig.1; col.5, lines 34-37) to a light output surface of light transmitting member (102-1,102-2; fig.1) for the purpose of positioning the diffusing layer on the light output surface of the light guide so as to diffuse output light extracted by oppositely positioned light output means (102-1,102-2,107-1,107-2). It would have been obvious to one having ordinary skill in the art at the time the invention was made

Art Unit: 2875

to provide the light pipe device (fig.13) of IWAMOTO including an adhesive layer of lower refractive index (than the plate-like member or light guide) bonding the light-diffusing layer to the output surface of the plate-like member as taught by IWAMOTO in order to substantially propagate light received from the edge or side surface through the length of the light guide of plate-like member by TIR until the light is extracted by light output means toward the output surface to be diffused by the light-diffusing layer toward the display to be uniformly illuminated.

9. In regards to the light-diffusing layer including fine prismatic structures, IWAMOTO teaches a diffusion sheet (104) including a roughened surface or particles (col.5, lines 28-32) which define such prismatic structures for the purpose of diffusing output light from the plate-like member (102,108). It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the light pipe device (fig.13) of IWAMOTO including roughened or prismatic structures of the light-diffusing layer as taught by IWAMOTO in order to uniformly illuminated the display.

10. In regards to the direction of maximum intensity of exiting light of the plate-like member being within 30 degrees with respect to a normal of the reference plane of the lower surface, it would have been obvious to one having ordinary skill in the art at the time the invention was made to form the light pipe device of IWAMOTO exiting or emitting light in a direction 30 degrees with respect to a normal to the reference plane of the lower or major surface of the plate-like member, since it has been held (In re Antonie, 559 F.2d 618, In re Boesch, 617 F.2d 272) that discovering an optimum value of a result effective variable involves only routine skill in the art. One would have been

motivated to form applicant's light pipe device to form its maximum intensity of output light exiting in the direction within the chosen optimal range of 30 degrees for the purpose of efficiently illuminating the adjacent display.

11. In regards to the adhesive layer constituting a tacky layer, it would have been obvious to one having ordinary skill in the art at the time of applicant's invention to provide the light pipe device of IWAMOTO with the adhesive layer constituting a tacky layer since it was known in the art that a tacky layer or substance is an art-equivalent reference to an adhesive substance.

12. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over IWAMOTO et al (US 5,046,826) as applied to claims 13, 14, 16, 17, 22 and 23 above, and further in view of YAMAMOTO et al (US 5,341,231).

13. IWAMOTO (fig.13) modified above discloses applicant's invention except an anti-reflection layer provided on the fine prismatic-structure layer of the light diffusing layer. YAMAMOTO teaches a light pipe or light plate member (161-fig.10) with either or both upper and lower surfaces (161a,161b) coated with an anti-reflection film (col.13, lines 42-46) for the purpose of inducing total internal reflection and preventing scratches. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the light pipe device of IWAMOTO et al to include the type of anti-reflection layer(s) on at least the light pipe major surfaces as taught by YAMAMOTO and associated with an adjacent light-diffusing layer in order to induce total internal

reflection in the light pipe and prevent scratches of the prismatic surface of either light plate member and/or the light-diffusing layer.

14. Claims 19-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over IWAMOTO et al (US 5,046,826) as applied to claims 13, 14, 16, 17, 22 and 23 above, and further in view of MASUDA et al (US 6,340,999).

15. IWAMOTO (fig.13) modified above discloses applicant's invention except: ridgelines defining edges of the optical path changing faces in a range of ± 30 degrees with respect to a reference plane of the incidence side surface; the refractive index of the adhesive layer being lower by a value of 0.01 to 0.2 than that of the plate-like member; and the refractive index of the adhesive layer not being higher than 1.47.

16. MASUDA teaches ridgelines or edges (defined by each vertex between 3d or 3e in fig.2) of the prismatic structures (3f) inclined within a range of ± 30 degrees (shown as 23 degrees in fig.2; col.13, lines 48-54; col.14, lines 14-18) with respect to the reference plane of the incidence side surface (3a) for the purpose of preventing second brightness fringe. It would have been obvious to one having ordinary skill in the art at the time of invention was made to modify the prismatic light pipe device of IWAMOTO by having the ridgelines of the prisms oriented within ± 30 degrees with respect to the reference plane of the light incidence side surface as taught by MASUDA in order to prevent second brightness fringe.

17. MASUDA teaches the refractive index of the adhesive layer being lower by a value about 0.2 or less than that of the plate-like member (col.16, lines 9-22) and not

being higher than 1.47 (col.16, lines 23-28) for the purpose of minimizing surface reflection (col.16, lines 9-14) between the adhesive or refractive layer and the light output surface of the light guide. It would have been obvious to one having ordinary skill in the art at the time of invention was made to modify the prismatic light pipe device of IWAMOTO to include the limited difference in refractive indices of the adhesive and plate-like plate as taught by MASUDA in order to minimize surface reflection.

18. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over IWAMOTO et al (US 5,046,826) as applied to claims 13, 14, 16, 17, 22 and 23 above, and further in view of CIUPKE et al (US 5,461,547).

19. IWAMOTO (fig.13) modified above discloses applicant invention except reflection type liquid-crystal display device. CIUPKE teaches a planar light source that includes a edge-lit plate-like member (11-figs.2 & 5) that is modified to illuminate a light-transmitting liquid crystal cell (12-fig.2) and a reflection type liquid crystal cell (12-fig.5) that includes a reflection layer (32-Fig.5). It would have been obvious to one having ordinary skill in the art at the time of applicant's invention to modify the planar light source or light pipe device of IWAMOTO et al to also illuminate an LCD with a reflective layer as taught by CIUPKE et al in order to be versatile in providing illumination for different types of LCDs, namely light transmitting and reflection types.

Allowable Subject Matter

20. Claim 6 is allowed.

21. Claim 18 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

22. Applicant's arguments filed September 30, 2002 in regards to claims 1-4 and 7-12 have been fully considered and have been addressed as follows. Applicant's amendment of claims 7 and 19 has overcome the indefiniteness regarding the "ridgelines" associated with the prismatic structures. However, the clarification of these claims with support of the specification on page 25 requires proper illustration as stated in the new drawing objection above in paragraph 1 of this Office Action. Furthermore, the rejection of claims as being anticipated by MASUDA above which include claim 7, has been modified from the original Office Action as now directing to figure 2 and passages in of MASUDA that meet applicant's limitation of the inclined angle of ± 30 degrees. The reasons for maintenance of the rejection of claims under the prior art are provided below.

23. Applicant's amendment of claim 1 includes the limitations of canceled claim 5 directed at least to an inclination angle range of the light output means to be 35 to 48 degrees with respect to a reference plane of the lower surface of the plate-like member. Applicant states that at least this feature, in combination with the other limitation recited in claim 1 is not taught or suggested by the prior art relied upon (namely, MASUDA). Applicant further states that 23 degree angle between the direction of the stripe of

Art Unit: 2875

concave-convex portions 3f and the horizontal direction of the pixel pattern of the display device 5 does not relate to applicant's inclination angle as claimed in claim 1.

In response, the rejection of amended claim 1 above has been modified from the last Office Action to state that "fig.1 (of MASUDA) shows that inclined surface 3e forms an inclination angle of approximately 40 degrees" in regards to applicant's limitation (of former claim 5 incorporated in amended claim 1) of the inclination angle in a range of 35 to 48 degrees. Adequate disclosure of applicant's inclination angle range is provided by the illustration of the inclination angle in MASUDA's figure 1 of the optical path change face (3e) measured to be about 40 degrees.

24. The original statements that claims 13-18 and 20-24 are allowable and that claim 19 had some allowable subject matter are withdrawn in view of newly cited references to IWAMOTO et al (US 5,046,826), YAMAMOTO et al (US 5,341,231), and CIUPKE et al (US 5,461,547).

Conclusion


25. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. KOKAWA et al (US 5,467,208) shows (figs.16,17) a light scattering transparent substrate (45) of an LCD having a front prismatic surface (45a) provided with an anti-reflection film (46).

Art Unit: 2875

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alan Cariaso whose telephone number is (703) 308-1952. The examiner can normally be reached on M-F (9:00-5:30 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sandra O'Shea can be reached on (703) 305-4939. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.



Alan Cariaso
Primary Examiner
Art Unit 2875

AC
January 11, 2003